

Engineering Institute Lecture Series



Dr. Michael B. Prime
Advanced Engineering Analysis (W-13)
Los Alamos National Laboratory

Forensic Determination of Residual Stresses in Fractured Parts

Tuesday, December 4, 2012

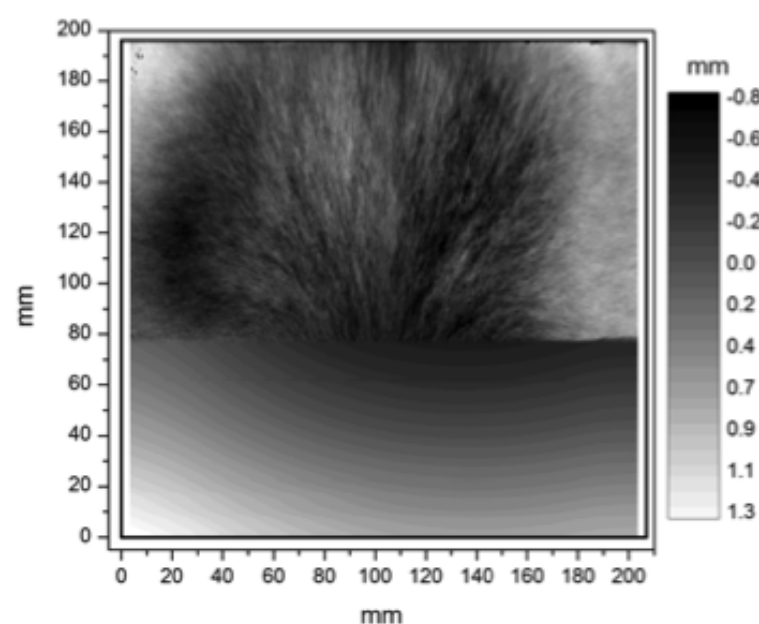
3:30 - 4:30 PM

**TA-3, Bldg. 0207, Room 216, Jemez/Cochiti Conference Rooms
(Study Center)**

Abstract: Residual stresses can be a major contributor, and even sometimes the sole factor, in failures caused by fatigue, brittle fracture, and stress corrosion cracking. This talk will first review residual stresses and their importance to structural integrity.

When a part fractures, the residual stresses are relaxed because of the new free surface. Therefore, it has always been assumed that the residual stresses that contributed to a fracture could not be recovered ex post facto. Using solid mechanics principles that are fascinating yet conceptually simple, this talk will demonstrate that the stresses can indeed be recovered after a brittle fracture. The technique is applied to a 7050-T74 aluminum alloy forging that spontaneously fractured while it was being cut in two. The results are validated by comparison with neutron diffraction measurements on another section of the same forging.

Biography: Mike Prime received a Ph.D. in Mechanical Engineering from U.C. Berkeley in 1994. He has worked at Los Alamos National Laboratory as a Research and Development Engineer for over 18 years, where he has received four Distinguished Performance Awards and six Defense Program Awards of Excellence. Mike was the co-designer and co-PI for the Barolo subcritical experiment completed at the Nevada Test Site in 2011. He invented and patented the contour method for measuring residual stress, which is used worldwide and has generated millions of dollars of business for a startup company in California. He co-founded the Residual Stress Summit, served as an Associate Technical Editor for Experimental Mechanics, was named an ASME Fellow in 2010, and received the A.J. Durelli award from the Society for Experimental Mechanics in 2012. In 1993 he set two world records in a Human Powered Vehicle he helped design and build as a student project.



Surface height measured on fractured forging. The bottom 80 mm of the figure is the EDM cut and the rest is the fracture surface.

For more information contact the technical host Chuck Farrar, farrar@lanl.gov, 663-5330.